

WHAT IS CLAIMED IS:



1. An electroplating solution for plating tin-bismuth solder coatings comprising:
a sulfonic acid electrolyte;
a tin compound soluble in the electrolyte to form a tin sulfonate;
a bismuth compound soluble in the electrolyte to form a bismuth sulfonate;
a non-ionic surfactant;
a grain refiner; and
an antioxidant.
2. The electroplating solution of claim 1 wherein the tin compound comprises a tin sulfonate.
3. The electroplating solution of claim 1 wherein the bismuth compound comprises a bismuth sulfonate.
4. The electroplating solution of claim 1 wherein the tin compound comprises tin methanesulfonate and the bismuth compound comprises bismuth methanesulfonate.
5. The electroplating solution of claim 1 wherein the sulfonic acid electrolyte comprises a soluble alkane or alkanol sulfonic acid containing 1-5 carbon atoms.
6. The electroplating solution of claim 1 wherein the sulfonic acid comprises methanesulfonic acid.

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7. The electroplating solution of claim 1 wherein the non-ionic surfactant comprises polyethylene glycol-block-polypropylene glycol with a molecular weight between 2000 and 10,000.

8. The electroplating solution of claim 1 wherein the non-ionic surfactant comprises polyethylene glycol-ran-polypropylene glycol with a molecular weight between 2,000 and 10,000.

9. The electroplating solution of claim 1 wherein the non-ionic surfactant comprises ethylenediamine tetrakis polyethylene glycol-block-polypropylene glycol tetrol with a molecular weight between 2,000 and 7,000.

10. The electroplating solution of claim 1 wherein the antioxidant comprises polyhydroxybenzine.

11. The electroplating solution of claim 1 wherein the grain refiner comprises an acrylic acid.